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JAPAN'S POLICIES FOR DECLINING INDUSTRIES: TWO CASE STUDIES

Summary

Tokyo's program to facilitate the retrenchment of basic materials industries hobbled by soaring energy prices or rising labor costs has had a mixed track record. As the first part of this report suggested (see JEI Report No. 34A, September 6, 1985), some industries have made the adjustment, at least on paper, while others continue to flounder. At these extremes are petrochemicals and aluminum -- the two most energy-intensive industries in any country. Eliminating excess capacity has given Japan's petrochemical industry an extended lease on existence in its present form, but this lease could soon run out, forcing manufacturers to make painful decisions they have so far avoided. Japanese primary aluminum producers have already reached this critical junction despite deep capacity cuts and other government-supported adjustment measures. Their continued existence now depends on what steps Tokyo is willing to take to maintain some domestic capability to produce this basic material.

Petrochemicals: Living on Borrowed Time

At first glance, the rebound of the petrochemical industry qualifies as the big success story of Tokyo's adjustment policies for declining industries. Three years ago, the 12 producers of ethylene, the basic building block for petrochemical intermediates like polyethylene, polypropylene, polyvinyl chloride, ethylene oxide, styrene and acrylonitrile were on the critical list, casualties of the convergence of several developments. The two oil crises of the 1970s had undercut the international competitive position of Japanese

ethylene makers by jacking up the price of naphtha -- their predominant feedstock and fuel -- roughly nine times, while the 1980-82 economic slump had slashed demand for downstream products at home and abroad. Capacity utilization had dropped to unprecedented levels, swelling unit costs already inflated by the steep hike in naphtha prices just as ethylene prices were tumbling. The result, not surprisingly, was a flood of red ink for the dozen ethylene manufacturers. Today, these same companies are running their plants at capacity -- albeit a capacity that is nearly one-third less than three years ago -- and operating in the black or at least close to the break-even point.

This is certainly evidence of an industry on the mend, but can the turnaround be credited to Tokyo's adjustment policies? Only in part, concede ethylene makers and Ministry of International Trade and Industry officials. The reduction of excess ethylene capacity orchestrated by the government was a key factor in the rebound, but ethylene producers also got some much-needed help from market forces: the worldwide economic upturn that started in 1983 boosted demand for ethylene and its derivatives while a drop in naphtha prices enabled manufacturers to control production costs. More importantly, does the turnaround signify that Japan's petrochemical industry is now viable over the medium to long run? No, industry and government representatives reluctantly admit, since only the symptoms of the erosion of international competitiveness -- surplus capacity -- have been treated, not the underlying causes.

The petrochemical industry's structural difficulties are not hard to identify. Topping the list is the high cost of naphtha. The steep run-up in international energy prices during the 1970s has hurt ethylene makers in all traditional producing countries, but stiffer price hikes for naphtha than for natural gas liquids opened up a big cost gap between ethylene manufactured in Japan and in the United States, where an ethane-propane mix is the feedstock for about 70 percent of ethylene output. To make matters worse, Tokyo's attempts to prop up money-losing oil refineries by regulating imports of less-expensive naphtha put Japanese-made ethylene at a further competitive disadvantage.

While the high cost of naphtha is its main handicap, the petrochemical industry has a host of secondary problems. For one, Japanese ethylene plants are generally smaller than crackers in the United States and therefore do not realize the same economies of scale. The largest facility in Japan is rated at 450,000 metric tons -- about one-third smaller than the plant size considered necessary for maximum efficiency. Most plants, including the newest, have a capacity somewhere around 300,000 metric tons, although several ethylene makers had plants in the early 1980s rated below 100,000 metric tons.

Japanese manufacturers are also less specialized than their American counterparts. The 12 producers of ethylene have developed similar lines of petrochemical intermediates and final products that differ little in quality terms. Competition, consequently, is based almost entirely on price. This is a situation tailor-made for price wars during periods of slumping demand and declining capacity utilization. What makes price wars inevitable under these conditions is that there is no dominant company in the Japanese petrochemical industry. The biggest ethylene producer, Mitsubishi Petrochemical Co., Ltd.,

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controls just one-eighth or so of output, while the top four makers, which include Mitsubishi Chemical Industries, Ltd., Nippon Petrochemicals Co., Ltd. and Mitsui Petrochemical Industries, Ltd., handle perhaps two-fifths.

These structural weaknesses were exposed by the 1973 oil crisis, but the industry's relatively fast and smooth recovery in the mid-1970s made it easy for manufacturers to ignore the signs of eroding international competitiveness. The 1979 oil shock was a different story: petrochemical companies could no longer postpone coming to grips with the industry's problems. They tried to at first, launching a price war to win sales in the shrinking market for ethylene and its derivatives. Acknowledging that this strategy did nothing except tighten their cost-price squeeze, ethylene producers decided in the summer of 1980 to restrict production voluntarily. This plan quickly fell apart, the victim of competitive pressures, forcing MITI to enter the picture in August 1981. Its attempts to restore some degree of pricing stability to the market by limiting ethylene output through administrative guidance were no more successful than the makers' own efforts.

Matters came to a head in 1982. Ethylene production fell for the third year in a row, dropping to just three-fourths of its 1979 peak (see Table 1); in the process, the operating rate slid to under 60 percent. The lingering recession in Japan was obviously the main drag on output, but it was not the only source of headaches. In a first for the industry, petrochemical imports matched exports in 1982. Overseas sales, which had absorbed roughly one-fifth of production in the mid-1970s, were cut in half in response to the widening price differential between Japanese and American ethylene derivatives in Southeast Asian markets. And in a double blow, U.S. petrochemical suppliers hiked their already high exports to Japan, capturing a significant share of the market for such commodity intermediates as polyethylene, polyvinyl chloride, ethylene glycol, ethylene dichloride and acrylonitrile.

Facing losses of Y82.2 billion ($373.6 million at Y220=$1.00) in the 1982 accounting period on top of a combined red-ink entry of Y57.7 billion ($262.3 million) in the previous business year, the 12 Japanese ethylene producers stepped up their long-running campaign for unrestricted naphtha imports and changes in the pricing formula for domestic naphtha. Their message to the government was straightforward: with naphtha already representing 70 percent of the cost of making ethylene and the depreciation of the yen in 1982 raising the feedstock's price, relief was urgent.

MITI, while insisting at first that its hands were tied, finally gave some ground. It upped the volume of foreign naphtha allowed into the country, enabling the petrochemical industry to meet 46 percent of its naphtha requirements with imports in 1982, compared to 36 percent the year before and 29 percent in 1980. Starting in April 1982, moreover, domestic naphtha prices were linked with international prices rather than set independently. At the same time, the government lowered the tax on domestic naphtha from 4.7 percent to 3.5 percent and agreed to lift it in April 1983.

Ethylene makers also got some help on the other side of the cost-price equation -- although only after another price war in the late spring and summer of 1982 had sent petrochemical prices plunging again. That October MITI talked the dozen ethylene companies into forming a recession cartel to coordinate

cutbacks in production to what was projected to be a profitable level. The cartel, which ran through June 1983, did shore up prices, but sluggish demand and an inventory overhang continued to keep prices below production costs.

Having persuaded producers of ethylene to set up a recession cartel, MITI tackled the tougher job of convincing makers of this product and its major derivatives to take the one step that might help them regain profitability -- reducing excess capacity, which not only represented a huge fixed corporate cost but also caused the industry's self-destructive price wars. The Industrial Structure Council, the ministry's advisory group, had been weighing various capacity-reduction proposals for the industry since April 1981. By December 1982, it had worked out plans for ethylene as well as polyethylene, polyvinyl chloride, styrene, ethylene oxide and acrylonitrile, targeting the amount of capacity that had to be decommissioned for each product after projecting production in FY 1985 and calculating how much capacity would be needed for this output level assuming a cost-effective operating rate of 90 percent. (The ISC also looked at polypropylene and polystyrene capacity, but decided it was more or less appropriate for estimated FY 1985 production.)

These plans were said to have the full backing of the industry, which participated in their formulation. But when MITI officials sat down with company representatives to figure out firm-by-firm capacity-reduction numbers, this support crumbled. Ethylene producers finally fell in line in June 1983, agreeing to lower capacity from 6.4 million metric tons to 4.1 million metric tons by March 1985 -- a 36 percent reduction on paper, but an 11 percent cut in reality since some 1.6 million metric tons of capacity had already been decommissioned. The logjam broken, manufacturers of polyolefins (polyethylene and polypropylene) and polyvinyl chloride endorsed plans the same month to scrap or mothball 22 percent and 24 percent of their respective capacity. They were followed in August by ethylene oxide makers, which accepted a reduction target of 27 percent. Styrene suppliers, however, dragged their heels on capacity cutbacks until the start of this year, when they conceded to eliminate 26 percent of plant and equipment, while acrylonitrile companies refused to sign up for restructuring.

Despite the problems in reaching a consensus on the disposal of surplus petrochemical capacity, this is really the only part of the various industry restructuring programs that has been implemented. Ethylene capacity, for example, was reduced by 32 percent to 4.3 million metric tons, with the cutback split almost evenly between scrapped and idled plant (see Table 1, JEI Report No. 34A, September 6, 1985), but it took a cartel plus restrictions on investment to achieve this long-overdue result. The same prods were also needed to ensure that makers of polyolefins and polyvinyl chloride shed excess capacity.

The four marketing consortiums Japan's 19 polyolefin makers set up in July 1983 to distribute polyethylene and polypropylene exist mainly in name only, eliminating a source of savings initially pegged at Y38 billion ($172.7 million) annually. Likewise, the four joint sales companies formed in April 1982 by the 17 producers of polyvinyl chloride have not realized the economies of scale achievable through consolidated marketing operations. MITI, moreover, has been no more successful in promoting collaborative arrangements in other business areas. In particular, most proposals for joint production of ethylene

derivatives or division of production of these commodity intermediates are still on the drawing boards.

The reluctance of petrochemical manufacturers to move beyond capacity reduction and deal with their competitive handicaps comes as no surprise. As industry watchers suspected, companies have found it difficult to put aside rivalries and team up with competitors in production, marketing or other areas. More importantly, changing domestic and international market conditions have lessened the pressure for remedial action. Production of ethylene and most petrochemical intermediates turned up in 1983's second half, spurred mainly by strengthening domestic demand but also by the U.S. rebound, which reduced the incentive for American petrochemical suppliers to ship to Japan's traditional export markets in Southeast Asia. With the recovery at home and abroad extending through 1984, ethylene output climbed to near-record levels and earnings replaced losses in most corporate balance sheets.

Petrochemical makers also got some relief on feedstock costs. Naphtha costs, which had averaged some Y57,000 ($259) per kiloliter in 1982 and Y49,400 ($225) the next year, dropped in 1984 to an average Y45,300 ($206) per kiloliter. Most of this decline represented falling world oil prices, but some of it reflected the elimination of the tax on domestic naphtha in April 1983. In addition, the government again expanded the volume of foreign naphtha allowed into the country, enabling the industry to supply 61 percent of its feedstock requirements with imported naphtha in both 1983 and 1984. Whatever its cause, the drop in naphtha costs saved petrochemical companies roughly Y102.5 billion ($466 million) last year and insured profitable operations in the face of flat product prices.

Restored profitability should not lull Japanese petrochemical manufacturers into believing that their competitive problems are behind them, warn industry analysts and MITI officials alike. For one, feedstock costs continue to be substantially higher in Japan than in the United States despite declining international oil prices and deregulation-triggered rises in U.S. natural gas prices. The strong dollar offsets some of this differential, but American petrochemical producers still have the ability to undercut Japanese makers in their home market and in Southeast Asia. With the next slump in U.S. demand, it is added, Japan's petrochemical industry could receive a painful reminder of its eroded competitiveness.

This reminder could come much sooner from another source -- the three export-geared petrochemical complexes that have gone into operation this year in Saudi Arabia. Using ethane as the feedstock, the three facilities can turn out 1.6 million metric tons of ethylene a year, earmarked mainly for the production of polyethylene and ethylene glycol. Although the Saudi government has said that exports will be spread throughout the world market and not concentrated on any one country, Japan is likely to be the main destination. In fact, one of the complexes, a joint venture between the Saudi Basic Industries Corp. and the Mitsubishi Group, was built with the intention of shipping three-fourths of its output to Japan. Other major Saudi export markets are expected to include the countries of Southeast Asia that have traditionally been customers of Japanese companies -- a potentially double blow for Japan's petrochemical industry.

Japanese petrochemical executives insist that they are no more blind to the new threats to the industry than they are to its old problems. As proof they cite the incipient movement to replace domestic production of commodity intermediates with imports and concentrate on higher value-added final products like engineering plastics. Critics respond that this is just one small part of the answer. The industry's viability over the medium run, it is maintained, hinges on consolidation through mergers. Barring that outcome, the second-best solution is joint operation of the most efficient plants, supported by collaboration in marketing, transportation and other areas. At a minimum, analysts add, petrochemical producers must decommission additional capacity. This move, if quickly implemented, should enable them to weather the next cyclical downturn in demand, but continued operation beyond that time requires more radical action. The choice is up to them.

Aluminum: Searching for a Life-Support System

If the current revival of the petrochemical industry represents the big success story of Tokyo's adjustment policies for declining industries, then the present deathbed condition of the primary aluminum industry is its most glaring failure. A quick reading of the industry's vital signs leaves no doubt about this conclusion. What were six producers of ingot and 14 plants eight years ago are today five companies with seven smelters -- yet none of them has made any money since the 1980 business year. Capacity has shrunk to just two-fifths of its 1973 size, but an operating rate of 40 percent is not uncommon. Perhaps most telling, ingot imports outweigh domestic production five to one.

The story of the compounding problems of the primary aluminum industry reads much like that of any other energy-intensive industry in Japan. Dependent on oil-fired power plants for roughly three-fourths of their huge electricity requirements, Japanese ingot manufacturers were hit far harder by the first surge in international energy prices than their American counterparts, which can tap less-expensive hydroelectric power and electricity generated by coal-burning plants for about the same proportion of their energy needs. On paper, though, the Japanese industry appeared to be coping successfully with the new production economics, staying right around the break-even point through the mid-1970s, thanks to resilient demand for aluminum at home, a sharp run-up in international product prices and improved energy efficiency.

Despite the appearance of adjustment, neither refiners nor MITI bureaucrats were optimistic about the industry's prospects. In a report released at the end of 1977, the Industrial Structure Council predicted that domestic demand would peak that year and that the appreciation of the yen would pull in more foreign-made ingot, already the source of one-third of the total aluminum supply (see Table 2). The advisory group recommended mothballing part of the industry's capacity, subsidizing the interest costs of mothballed assets and introducing a tariff quota system to moderate import competition. This proposal fell short of the industry's demand for either subsidized electricity rates or a public corporation to buy and sell all domestic and foreign ingot and control entries from abroad. Both options were out of the question, MITI told producers, which were finally persuaded in the fall of 1978 to pare capacity from 1.6 million metric tons to 1.1 million metric tons. The ministry's parallel effort to encourage the six primary aluminum makers to tie up in two groups for production and sales went nowhere, however.

Refiners completed the capacity cutback in a matter of months, beating the 1979 oil crisis by half a year. Although the jump in oil prices pushed electricity costs up to 40 percent of production costs by lifting them from Y8.5 per kilowatt-hour to Y16, it again looked at first like the Japanese industry would overcome the new blow to its competitive position. With speculation inflating international spot-market ingot prices in 1979 and the first part of 1980, smelters were able to boost prices to cover their higher costs. Moreover, demand remained firm, allowing producers to maintain full-capacity operation.

The industry's pricing flexibility came to an abrupt end in the spring of 1980 when the speculative bubble burst and the world economy moved into recession. Domestic ingot prices, which had hit Y508,000 ($2,309) per metric ton in April 1980, plunged, dropping to Y460,000 ($2,090) in July and then falling to Y350,000 ($1,591) a year later. Smelters were caught in a classic cost-price squeeze. Already the world's most efficient producers, requiring only 15,000 kilowatt-hours of electricity to manufacture a metric ton of ingot compared with the 17,500 kilowatt-hours needed in the United States and Canada, Japanese refiners had little room to lower costs.

In a one-two punch to the industry, domestic demand for ingot contracted in 1980 and again the following year while Japanese aluminum fabricators -- which, with one exception, are not affiliated with primary producers -- stepped up their ingot purchases from abroad. This switch in sourcing was not surprising. At Y412,100 ($1,873) per metric ton in April 1980, imported ingot prices were well below peak Japanese prices, and they continued to fall in succeeding months, reaching Y333,900 ($1,518) in July 1981, in response not only to the drop in international spot-market prices but also because of the yen's appreciation.

Their losses mounting, smelters reopened the debate with MITI over options. Once more, the two agendas shared few points in common. Corporate executives renewed their campaign for electricity rate subsidies and import curbs, especially on spot-market imports of American ingot, which, they claimed, were the major cause of 1980's import surge. The ministry again vetoed these alternatives as being economically and politically impossible to implement and pressed instead for joint production and marketing. This course of action, however, was just as distasteful to the industry in 1981 as it had been three years before. That left an additional round of plant closings as the only major option open for discussion.

The Industrial Structure Council issued another report on the outlook for the aluminum industry in October 1981, recommending a cutback in capacity from 1.1 million metric tons to 700,000 metric tons by FY 1985. Refiners had no objections to this target, but divvying up the reduction among the six companies proved to be another matter. With help from an unexpected corner -- the smallest producer decided to pull out of the ingot business, MITI finally forged an industry consensus in June 1982. By that time, however, production was running at only half of the capacity level projected for FY 1985.

This was not the only problem with the new restructuring program. There was also the question of how the industry was to finance the estimated Y45 billion ($204.6 million) cost of eliminating 400,000-plus metric tons of

capacity when it had already lost Y53.6 billion ($255.9 million) in the 1981 financial year and was on the way to losing another Y97.5 billion ($443.2 million) in the 1982 business period. MITI and the refiners thought they had found the answer in a two-part plan that was a variant of something tried in 1978. Refiners buying ingot under long-term contract or from overseas primary aluminum projects in which they had a stake would be allowed to import duty-free; so would fabricators and trading companies purchasing from these same sources, but they would be billed for the equivalent of two-thirds of the normal 9 percent tariff on ingot, with this money transferred to smelters to finance capacity disposal.

This proposal was shot down by the Finance Ministry as too expensive in terms of lost tariff revenue. U.S. government opposition also killed the plan, which basically would have left the 9 percent tariff only on spot-market purchases. Enacted in its place was a MITI-industry alternative. Under this program, which ran from April 1982 through March 1985, the duty on a preset volume of ingot purchased by refiners from any supply source was fully rebated. Imports eligible for the program were capped at roughly 400,000 metric tons a year -- an amount equal to the capacity targeted for disposal under the industry's 1982 restructuring plan, with this ceiling allocated among smelters in proportion to the volume of plant closed.

Like the capacity-reduction program, the tariff rebate plan, which generated roughly Y10 billion to Y13 billion ($45.5 million to $59.1 million) a year for the primary aluminum industry, was an example of a government initiative that gave refiners a little breathing space but did nothing to change their prognosis. This became clear in 1983. Domestic demand for ingot revived, but with Japanese production costs so far out of line with the competition's, smelters gave up more of their home market to imports, which hit 1.6 million metric tons compared with a domestic output of just 256,000 metric tons. The industry's only gain from the recovery was that stronger world demand lifted international ingot prices, thereby shoring up prices in Japan and narrowing losses in the 1983 accounting year to Y78.6 billion ($357.3 million).

The recovery's benefits for Japanese aluminum producers were not only slight but also short-lived. International prices reached a cyclical peak in the fall of 1983 and then began a long slide lasting through 1984. This put continuing pressure on domestic prices, which once again did not cover variable costs, much less fixed costs, despite some help on the electricity rate front from declining world oil prices.

Given these market conditions, it was no surprise to find aluminum company representatives camped on MITI's doorstep. It was also no surprise that the discussions, now in their third round, had a certain sameness to them -- as did the outcome. Last December the Industrial Structure Council proposed yet another downsizing for the industry, this time from 700,000 metric tons of capacity to 350,000 metric tons by March 1988. Coupled with this proposal was the recommendation that two of the seven smelters still in operation be decommissioned, leaving each company with one facility.

Although primary aluminum makers were drowning in red ink, it took them until March 1985 to reach agreement with MITI on how the ISC plan would be

implemented. In one sense, though, the delay paid off since the tariff rebate system, originally scheduled to expire that month, was extended through March 1988. One modification was introduced: instead of receiving a rebate on the full 9 percent ingot duty, refiners now get 8 percent back.

Is there any reason to believe that the latest restructuring plan will be any more successful than its two predecessors in establishing a viable primary aluminum industry in Japan? The answer is clearly no. The most that can be expected from a program designed mainly to deal with the symptoms rather than the causes of lost Japanese international competitiveness is an industry shrunken down to the country's two most efficient plants. One is a 64,000 metric ton smelter operated by Nippon Light Metal Co., Ltd., the number-one refiner in terms of sales and the only integrated Japanese aluminum maker; this facility has its own hydroelectric plant. The other is Mitsui Aluminum Co., Ltd.'s 144,000 metric ton smelter, which uses powdered coal for electricity generation.

This outcome would meet Tokyo's goal of preserving some domestic primary aluminum production capability for economic security reasons. Direct government subsidies might still be required to maintain this base, however. They certainly would be necessary if the government wanted to retain more than the 200,000-plus metric tons of capacity available at the Nippon Light Metal and Mitsui Aluminum smelters.

For further information, contact Susan MacKnight.

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The views expressed in this report are those of the author and do not necessarily represent those of the Japan Economic Institute.

Table 1: Japan's Apparent Supply of Selected Petrochemicals, 1973-84

(in metric tons)

1a: Ethylene

Year	Production	Exports	Imports	Ratio of Imports to Supply	Ratio of Imports to Production
1973	n.a.	0	0	0.0	0.0
1974	4,175,810	0	0	0.0	0.0
1975	3,399,099	0	0	0.0	0.0
1976	3,802,919	13	0	0.0	0.0
1977	3,978,605	7	0	0.0	0.0
1978	4,387,409	19	---	0.0	0.0
1979	4,783,726	440	2,402	0.1	0.1
1980	4,175,263	13,169	5,399	0.1	0.1
1981	3,654,600	16,147	0	0.0	0.0
1982	3,589,700	15,591	0	0.0	0.0
1983	3,687,700	9,005	0	0.0	0.0
1984	4,385,700	3,207	22,781	0.5	0.5

1b: Ethylene Oxide*

Year	Production	Exports	Imports	Ratio of Imports to Supply	Ratio of Imports to Production
1973	402,553	n.a.	---	---	---
1974	414,653	n.a.	0	0.0	0.0
1975	509,117	n.a.	---	---	---
1976	546,751	135	---	---	---
1977	537,586	200	0	0.0	0.0
1978	630,616	245	2	---	---
1979	593,104	217	0	0.0	0.0
1980	528,621	145	---	---	---
1981	477,762	74	---	---	---
1982	471,151	17	---	---	---
1983	467,927	7	1	---	---
1984	532,795	10	3	---	---

*Ethylene oxide is a gas and therefore not generally traded.

1c: Ethylene Glycol*

Year	Production	Exports	Imports			Ratio of Imports to Supply	Ratio of Imports to Production
			Total	United States	Canada		
1973	377,613	n.a.	20,621	11,422	0	5.2	5.5
1974	403,203	n.a.	55,602	18,828	34	12.1	13.8
1975	534,278	n.a.	28	2	0	---	---
1976	549,282	157,335	2,614	1	0	0.7	0.5
1977	522,894	201,702	7,149	5,150	0	2.2	1.4
1978	630,197	224,327	23,906	16,853	0	5.6	3.8
1979	571,554	147,436	57,019	37,805	0	11.9	10.0
1980	492,202	77,285	80,866	47,292	2,302	16.3	16.4
1981	410,641	50,004	99,883	20,607	59,345	21.7	24.3
1982	384,921	11,580	154,672	88,520	47,742	29.3	40.2
1983	357,471	21,779	158,691	93,985	31,815	32.1	44.4
1984	428,804	39,416	186,484	105,532	57,452	32.4	43.5

*While not covered by the 1983 industrial adjustment law, ethylene glycol is included here because its production is the main use of ethylene oxide.

1d: Ethylene Dichloride*

Year	Production	Exports	Imports				Ratio of Imports to Supply	Ratio of Imports to Production
			Total	United States	Canada	Brazil		
1973	2,180,994	n.a.	80,994	59,738	0	0	3.6	3.7
1974	2,196,607	n.a.	134,335	118,550	0	0	5.8	6.1
1975	1,771,315	n.a.	2,215	2,215	0	0	0.1	0.1
1976	1,653,056	n.a.	89,098	87,109	0	0	5.1	5.4
1977	1,723,105	n.a.	51,513	51,513	0	0	2.9	3.0
1978	1,836,690	n.a.	193,329	180,662	0	0	9.5	10.5
1979	2,110,487	n.a.	387,450	352,626	5,975	0	15.5	18.4
1980	2,060,326	n.a.	201,767	92,495	109,270	0	8.9	9.8
1981	1,650,281	n.a.	179,098	94,240	83,803	1,055	9.8	10.9
1982	1,547,585	n.a.	359,508	191,562	112,207	33,900	18.9	23.2
1983	1,735,800	n.a.	457,065	278,752	61,927	63,021	20.8	26.3
1984	1,939,234	n.a.	486,021	225,805	94,121	97,231	20.0	25.1

*Although ethylene dichloride is not covered by the 1983 industrial adjustment law, it is listed here because it is used to make vinyl chloride monomer, which in turn is used to make polyvinyl chloride, a designated product.

1e: Polyvinyl Chloride

Year	Production	Exports	Imports		Ratio of Imports to Supply	Ratio of Imports to Production
			Total	United States		
1973	1,318,294	150,580	55,955	4,736	4.6	4.2
1974	1,466,889	185,458	43,009	8,106	3.2	2.9
1975	1,125,401	169,509	3,897	1,214	0.4	0.3
1976	1,043,963	159,941	14,839	993	1.7	1.4
1977	1,030,751	127,839	11,604	381	1.3	1.1
1978	1,204,274	80,913	33,156	695	2.9	2.8
1979	1,592,129	122,004	17,846	1,620	1.2	1.1
1980	1,429,298	98,972	35,998	8,008	2.6	2.5
1981	1,129,491	58,783	77,481	23,321	6.7	6.9
1982	1,218,067	59,552	117,831	43,147	9.2	9.7
1983	1,420,396	84,440	72,569	8,732	5.2	5.1
1984	1,503,882	80,201	77,510	840	5.2	5.2

1f: Styrene Monomer

Year	Production	Exports	Imports		Ratio of Imports to Supply	Ratio of Imports to Production
			Total	United States		
1973	935,474	42,987	11,894	11,894	1.3	1.3
1974	1,034,307	97,867	22,085	21,544	2.3	2.1
1975	876,748	72,583	---	---	---	---
1976	1,088,685	58,055	13,003	2,050	1.2	1.2
1977	1,021,720	39,784	13,270	1,557	1.3	1.3
1978	1,122,398	40,583	28,756	19,836	2.6	2.6
1979	1,238,284	16,309	63,778	41,819	5.0	5.2
1980	1,114,246	2,590	109,482	81,178	9.0	9.8
1981	1,095,147	5,915	166,793	141,128	13.3	15.2
1982	1,085,511	20,358	76,694	50,386	6.7	7.1
1983	1,167,198	2,024	118,725	71,340	9.2	10.2
1984	1,423,312	5,148	132,185	76,966	8.5	9.3

1g: Polyethylene

Year	Production	Exports	Imports		Ratio of Imports to Supply	Ratio of Imports to Production
			Total	United States		
1973	1,671,695	399,721	4,760	3,337	0.4	0.3
1974	1,897,047	363,655	18,771	10,568	1.2	1.0
1975	1,294,529	413,365	251	203	---	---
1976	1,392,461	355,130	1,188	937	0.1	0.1
1977	1,466,724	437,407	999	543	0.1	0.1
1978	1,766,572	423,474	7,722	1,192	0.6	0.4
1979	2,165,308	304,449	8,831	3,980	0.5	0.4
1980	1,860,198	274,532	14,884	3,441	0.9	0.8
1981	1,670,675	281,392	49,045	9,335	3.4	2.9
1982	1,774,101	273,185	67,654	16,302	4.3	3.8
1983	1,773,050	249,304	39,275	9,619	2.5	2.2
1984	2,251,072	297,292	28,446	3,826	1.4	1.3

1h: Polypropylene

Year	Production	Exports	Imports		Ratio of Imports to Supply	Ratio of Imports to Production
			Total	United States		
1973	693,318	140,901	6,790	6,405	1.2	1.0
1974	791,685	99,569	10,172	7,499	1.4	1.3
1975	594,482	154,348	96	80	---	---
1976	668,970	115,586	132	131	---	---
1977	607,830	141,531	405	41	0.1	0.1
1978	744,662	160,762	473	182	0.1	0.1
1979	1,022,717	98,313	9,277	4,263	1.0	0.9
1980	927,170	66,762	15,735	4,483	1.8	1.7
1981	958,634	117,032	15,971	1,462	1.9	1.7
1982	940,851	116,212	7,497	1,376	0.9	0.8
1983	1,062,071	100,644	7,841	1,398	0.8	0.7
1984	1,271,453	97,947	4,526	139	0.4	0.4

Source: Ministry of International Trade and Industry, Industrial Statistics Monthly, and Japan Tariff Association, Japan Exports and Imports: Commodity by Country

Table 2: Japan's Apparent Supply of Primary Aluminum Ingot, 1973-84

(in metric tons)

Year	Production	Exports	Imports					Ratio of Imports to Supply	Ratio of Imports to Production
			Total	United States	Canada	Australia	New Zealand		
1973	1,096,765	2,875	475,654	41,133	79,576	37,752	76,801	30.3	43.4
1974	1,118,374	34,860	478,904	65,398	73,917	31,162	82,105	30.7	42.8
1975	1,013,259	83,506	378,333	30,246	48,330	66,548	82,661	28.9	37.3
1976	919,425	69,706	430,125	34,228	12,963	44,319	105,156	33.6	46.8
1977	1,188,197	99,649	533,807	11,478	67,386	61,371	110,284	32.9	44.9
1978	1,057,710	54,594	740,204	39,443	124,997	59,125	121,551	42.5	70.0
1979	1,010,409	7,946	748,438	109,270	108,811	37,425	110,132	42.7	74.1
1980	1,091,477	7,644	910,085	308,712	123,589	26,368	93,079	45.6	83.4
1981	770,602	12,160	1,129,322	266,325	116,152	69,580	108,574	59.8	146.6
1982	350,706	6,681	1,446,566	306,456	193,110	111,661	122,833	80.8	412.5
1983	255,900	1,679	1,603,732	259,466	141,621	114,735	175,954	86.3	626.7
1984	286,728	2,283	1,347,817	177,683	111,405	236,530	154,246	82.6	470.1

Source: Ministry of International Trade and Industry, Industrial Statistics Monthly, and Japan Tariff Association, Japan Exports and Imports: Commodity by Country